

REMARKS

Upon entry of this amendment, claims 1, 3, 4, 5, 7, 8, 10-22, 25-28 and 30-34 are pending. Claims 1, 3, 4, 7, 10, 11, 13, 20, 21, 25 and 30 have been amended and claims 2, 6, 9, 23, 24, and 29 have been cancelled. The Examiner has identified original claims 6-8 and 15 as allowable. Further, the Examiner has rejected claims 25-27 and 30-34 under 35 U.S.C. §112 and original claims 1-5, 9, 20-23, 25-29 and 31-34 as anticipated by Doerge and original claims 1-5, 9-14 and 16-34 as anticipated by Scherzer. Applicants have rendered moot these rejections and respectfully request reconsideration of the pending claims.

The rejections under §112 are respectfully traversed. By utilizing the middle-ground transition, "consisting of", Applicants have excluded from the listed elements only those additional elements that would cause a material change in the basic and novel characteristics of the invention. Thus, Applicants have not recited elements that would otherwise be excluded by this transition, especially as these claims have been amended.

As amended, all independent claims, whether to the method, reaction mixture or foam produced thereby, include the limitations that the at least one polyol selected from the claimed group makes up from 50% to 100% by weight of all polyols in the mixture and that the at least one blowing agent makes up more than about 80% by weight of all blowing agents in the reaction mixture. It should be noted that the percent by weight of the at least one blowing agent is inherently exclusive of added water. Support for these amendments may be found throughout the application including at page 4, lines 20-30; page 5, line 15 - page 6 line 18; and the original claims. None of these limitations are found in either cited references.

Doerge discloses the use of mixtures of chlorofluorocarbons and alkyl alkanoates as blowing agents for foams. The improvement -- and at least one critical limitation -- of the Doerge invention is that the mixture is from 95 to 50 percent by weight chlorofluorocarbon and from 5 to 50 percent by weight of an alkyl alkanoate. Doerge, col. 1, l. 68 - col. 2, l. 9. Doerge does not disclose the use of an alkyl alkanoate in a greater than 50 percent by weight concentration, as claimed in the present application. As further discussed by Applicants in the Description of the Prior Art in the present application, it is the use of methyl formate as the *primary* blowing agent to produce rigid foams having the desired characteristics that had not been successfully accomplished in the prior art.

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PATENT

Applicants have incorporated the blowing agent percentage by weight limitation of allowed claim 6 into the independent claims 1 (method for production), 20 (reaction mixture), and 25 (reaction mixture). As Doerge fails to disclose any such element, it cannot anticipate any of these independent claims or the claims dependant therefrom.

Similarly, Scherzer fails to serve as a proper basis for rejection. Scherzer discloses and claims the use of apparently novel isocyanates in combination with a laundry list of known blowing agents and polyols suitable for rigid, closed-cell foams. As with Doerge, Scherzer fails to disclose any ratio of primary alkyl alkanoate to secondary non-alkyl alkanoate blowing agent suitable for the generation of rigid foams having the desired characteristics. Moreover, Doerge fails to disclose, in combination with any blowing agent(s), the use of at least one polyol from the claimed Markush group wherein all said polyols together comprise from 50% to 100% by weight of all polyols in the reaction mixture. Although Doerge, as many other references, identifies the generally known utility of various polyester, polyether and other polyols in rigid closed-cell foams, neither the claimed polyols nor the claimed ratios are disclosed.


The remarks and amendments made herein shall not be understood or interpreted to disclaim or limit the scope of the claims in any way except as narrowly identified herein.

CONCLUSION

Prompt and favorable consideration of this application, as amended, is respectfully requested. Any deficiency or overpayment in fees paid may be charged to Deposit Account No. 19-3140. If there is anything further we can do, please contact the undersigned directly.

Respectfully submitted,

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CLEAN VERSION OF ENTIRE CLAIM SET

1. A method for producing a rigid, closed-cell polyurethane foam having a free-rise density of from about 1.3 lbs./ft.³ to about 4 lbs./ft.³ and exhibiting a shrinkage of less than 10%, comprising mixing together:

(a) an isocyanate,

(b) at least one polyol having a hydroxyl number of from about 150 to about 800 and being selected from the group consisting of polyalkoxylated amines, polyalkoxylated ethers, and polyester polyols, wherein all of said at least one polyols make up from 50% by weight to 100% by weight of all polyols in the reaction mixture; and

(c) at least one blowing agent selected from the group consisting of methyl formate, derivatives of methyl formate, precursors of methyl formate, and combinations thereof, wherein all of said at least one blowing agents make up more than about 80% by weight of all blowing agents in the reaction mixture;

to form a reaction mixture curable to produce the foam.

2. CANCELLED

3. A method as set forth in claim 1, further comprising the step of reacting the isocyanate and the at least one polyol in the reaction mixture to produce the foam.

4. A method as set forth in claim 3, wherein the at least one blowing agent is methyl formate.

5. A method as set forth in claim 4, wherein the method comprises mixing together (a), (b), (c) and water as a second blowing agent to form the reaction mixture.

6. CANCELLED

7. A method as set forth in claim 4 wherein methyl formate makes up more than about 90% by weight of all blowing agents in the reaction mixture.

8. A method as set forth in claim 7 wherein methyl formate makes up more than about 95% by weight of all blowing agents in the reaction mixture.

9. CANCELLED

10. A method as set forth in claim 5 wherein methyl formate and water together make up more than about 90% by weight of all blowing agents in the reaction mixture.

11. A method as set forth in claim 10 wherein methyl formate and water together make up more than about 95% by weight of all blowing agents in the reaction mixture.

12. A method as set forth in claim 11 wherein methyl formate and water together make up more than about 98% by weight of all blowing agents in the reaction mixture.
13. A method as set forth in claim 5 wherein CFCs, HCFCs and HFCs together make up less than about 20% by weight of the blowing agents in the reaction mixture.
14. A method as set forth in claim 13 wherein organic compounds other than methyl formate make up less than about 20% by weight of the blowing agents in the reaction mixture.
15. A method as set forth in claim 13 wherein organic compounds other than methyl formate make up less than about 2% by weight of the blowing agents in the reaction mixture.
16. A method as set forth in claim 14 wherein the reaction mixture is free of CFCs, HCFCs and HFCs.
17. A method as set forth in claim 16 wherein the reaction mixture is free of substituted and unsubstituted hydrocarbon blowing agents other than methyl formate.
18. A method as set forth in claim 16 wherein the reaction mixture is free of organic blowing agents other than methyl formate.
19. A method as set forth in claim 5 wherein the methyl formate and water are the only blowing agents in the reaction mixture.
20. A reaction mixture curable to form a rigid, closed-cell polyurethane foam having a free-rise density of from about 1.3 lbs./ft.³ to about 4 lbs./ft.³ and exhibiting a shrinkage of less than 10%, comprising:
- (a) an isocyanate,
 - (b) at least one polyol having a hydroxyl number of from about 150 to about 800 and being selected from the group consisting of polyalkoxylated amines, polyalkoxylated ethers, and polyester polyols, wherein all of said at least one polyols making up from 50% by weight to 100% by weight of all polyols in the reaction mixture, and
 - (c) at least one blowing agent selected from the group consisting of methyl formate, derivatives of methyl formate, precursors of methyl formate, and combinations thereof, wherein all of said at least one blowing agents make up more than about 80% by weight of all blowing agents in the reaction mixture.
21. A reaction mixture as set forth in claim 20 wherein the at least one blowing agent is methyl formate.
22. A reaction mixture as set forth in claim 21, further comprising water as a second blowing agent.
23. CANCELLED
24. CANCELLED

25. A reaction mixture as set forth in claim 20, consisting essentially of:
- (a) an isocyanate,
 - (b) at least one polyol having a hydroxyl number of from about 150 to about 800 and being selected from the group consisting of polyalkoxylated amines, polyalkoxylated ethers, and polyester polyols, wherein all of said at least one polyols make up from 50% to 100% by weight of all polyols in the reaction mixture;
 - (c) from 0% to about 50% by weight of at least one other polyol, and
 - (d) at least one blowing agent selected from the group consisting of methyl formate, derivatives of methyl formate, precursors of methyl formate, and combinations thereof, wherein all of said at least one blowing agents make up more than about 80% by weight of all blowing agents in the reaction mixture.
26. A reaction mixture as set forth in claim 25 wherein the blowing agent is methyl formate.
27. A reaction mixture as set forth in claim 26, further comprising water that acts as a second blowing agent.
28. A rigid, closed-cell polyurethane foam having a free-rise density of from about 1.3 lbs./ft.³ to about 4 lbs./ft.³ and exhibiting a shrinkage of less than 10%, produced by the method of claim 3.
29. CANCELLED
30. A foam as set forth in claim 28 wherein the gas is free of CFCs, HCFCs, HFCs and hydrocarbons.
31. A foam as set forth in claim 28 wherein the foam is suitable for use as a flotation foam.
32. A foam as set forth in claim 28 wherein the foam is suitable for use as structural foam.
33. A foam as set forth in claim 28 wherein the foam is suitable for use as an insulation foam.
34. A watercraft comprising a foam as set forth in claim 31.